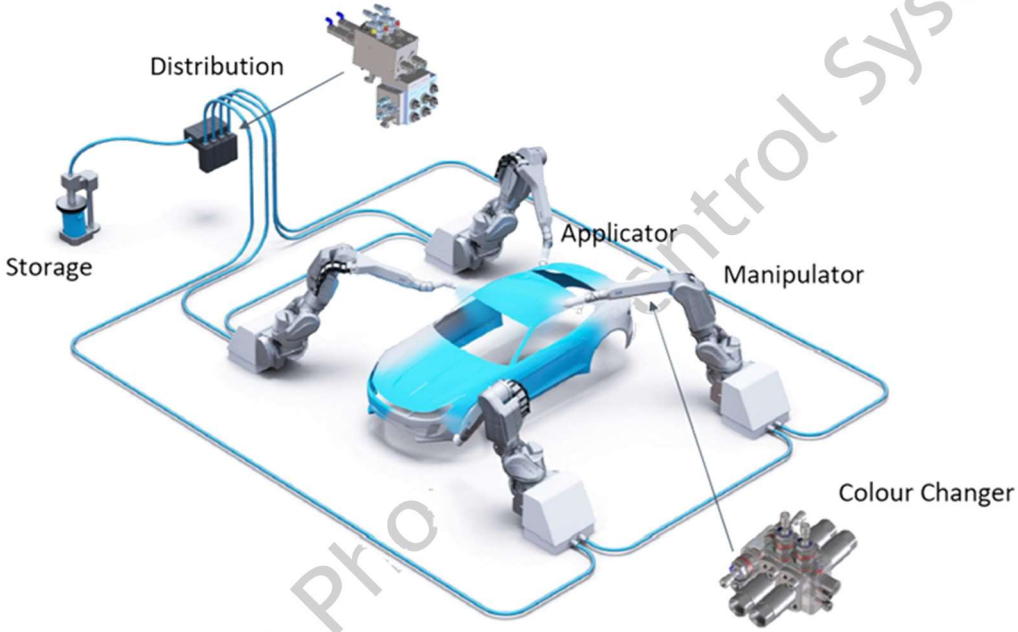
Painting Robots

We automatically think of the automotive industry when we consider the use of robots for painting, long lines of robots weaving their way around the inside and outside of car bodies. Off course this is an area where painting robots have been working for many decades now, but we are seeing a new interest in paint robots for much smaller applications which have traditionally been carried out by hand. Spray painting is typically a task that is unpleasant for humans and in a lot of cases an environment which is toxic as well. Which leads to one big advantage in using robots for this role as they are able to take on this potentially unpleasant and dangerous work.

A robotic painting installation is made of a number of principal elements outlined below:



*The **Eco**Supply P Basic Single Pass System by Durr*

The **Robot Manipulator** itself which will carry out the painting movements over the part or parts to be sprayed. The manipulator will have a high degree of freedom of movements to allow for smooth and fluid trajectories around the part or parts to be sprayed.

Paint robots are usually designed to contain the paint application piping and where appropriate colour changers within the structure of the arm of the robot eliminates the risk of cables and hoses snagging and contamination from paint material.

It is possible that the material being sprayed when vaporised can bring rise to an explosion risk in which case the robot will need to have the appropriate Atex protection rating to comply with the Atex rating of the zone that it will be working in. This is an important consideration for any new cell so we will consider below this subject in a bit more detail.

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The HSE states that an explosive atmosphere is:
a mixture of dangerous substances with air, under atmospheric conditions, in the form of gases, vapours, mist or dust in which, after ignition has occurred, combustion spreads to the entire unburned mixture. Atmospheric conditions are commonly referred to as ambient temperatures and pressures. That is to say temperatures of -20°C to 40°C and pressures of 0.8 to 1.1 bar.

For any new project it will be necessary to establish the Atex rating for the zone where the application will take place, the HSE directs that:
Employers must classify areas where hazardous explosive atmospheres may occur into zones. The classification given to a particular zone, and its size and location, depends on the likelihood of an explosive atmosphere occurring and its persistence if it does.

For gases, vapours and mists we have the following zones:
Zone 0: A place in which an explosive atmosphere consisting of a mixture with air of dangerous substances in the form of gas, vapour or mist is present continuously or for long periods or frequently.
Equipment category 1 (1G/1D) – Very high level of protection

Zone 1: A place in which an explosive atmosphere consisting of a mixture with air of dangerous substances in the form of gas, vapour or mist is likely to occur in normal operation occasionally.
Equipment category 2 (2G/2D) – High level of protection

Zone 2: A place in which an explosive atmosphere consisting of a mixture with air of dangerous substances in the form of gas, vapour or mist is not likely to occur in normal operation but, if it does occur, will persist for a short period only.
Equipment category 3 (3G/3D) – Normal level of protection

For dusts we have the following zones:
Zone 20: A place in which an explosive atmosphere in the form of a cloud of combustible dust in air is present continuously, or for long periods or frequently.
Equipment category 1 (1G/1D) – Very high level of protection

Zone 21: A place in which an explosive atmosphere in the form of a cloud of combustible dust in air is likely to occur in normal operation occasionally. Equipment category 2 (2G/2D) – High level of protection

Zone 22: A place in which an explosive atmosphere in the form of a cloud of combustible dust in air is not likely to occur in normal operation but, if it does occur, will persist for a short period only.
Equipment category 3 (3G/3D) – Normal level of protection

The robot manufacturer will indicate the rating for their robot ranges. For example in the case of the FANUC range of paint robots: All FANUC paint robots are explosion proofed and fully ATEX compliant for category 2 and Group IIG (previously zone 1)

The **Applicator** which is mounted on the robot flange to apply the material. There are different types of applicator depending on the material and coverage required. For example, we have:

- Air based spray guns supplying paint via a nozzle with control of paint flow.
- Airless spray guns supplying paint via a nozzle with control of paint flow.
- Electrostatic spray guns with HT to provide greater material transfer.
- Rotary bell type applicators with control of the fan shape and HT.
- Mixing systems for materials with catalyst.

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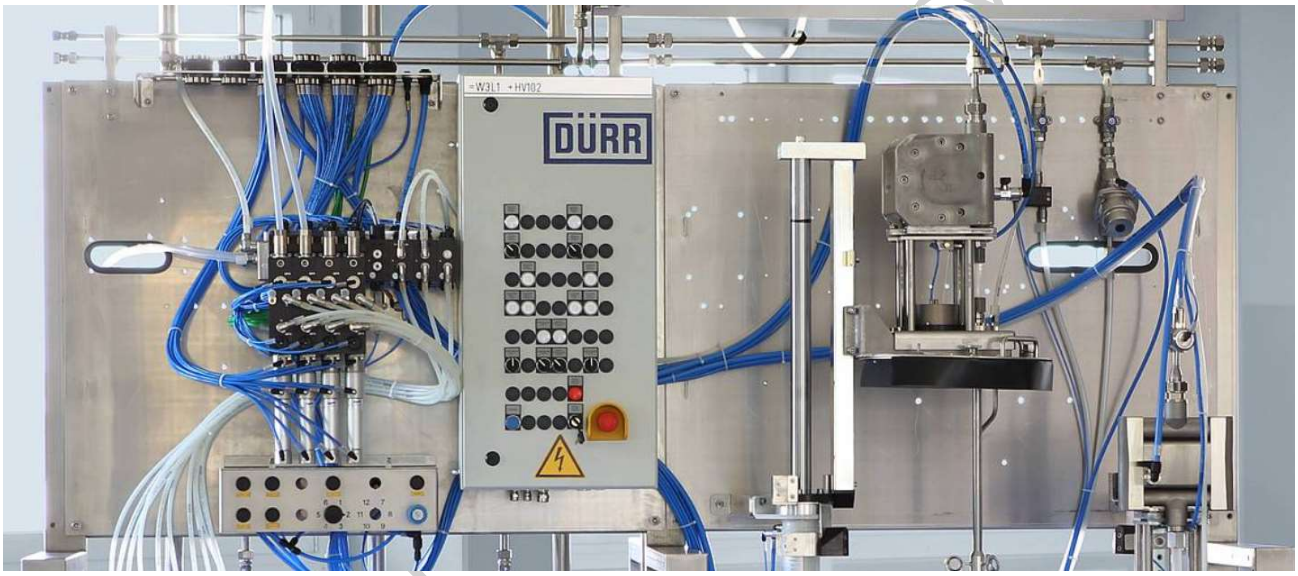
The **Distribution or Paint Supply System** To bring the material to the robot and ultimately the applicator. When considering paint application whether manual or robotic the storage and supply of the material or materials to the gun needs to be taken into account. Some of the main elements being:

Agitators for correct mixing of the material in the storage containers.
Pumping systems for taking the material from the storage containers through the supply network to the base of the robot.
Fluid pressure and air regulators for fluid control.
Control system for managing the distribution process.

Shown below is the Durr EcoSupply P standardized modular paint supply system. This system employs pig technology and is equally suited to water based and solvent borne paints.



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